Acoustic Noise Control Device

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Please note: Readers' Circuits have not been tested or post-engineered by the Elektor Electronics design laboratory.

The circuit described here is used to control the acoustic noise levels produced in a room or office. The main idea behind installing the device is that it employs asks human speech to request the people making noise to be quiet. The circuit is quite complex because the device reacts not only to a certain instantaneous noise level but on its duration as well. For example, the device will ignore coughing and sneezing noises. However, if someone sneezes too often and too loud the device will react with an appropriate warning message.

How it works

The circuit diagram of the device is given in **Figure 1**. It can be divided onto four parts. The first part is a run of the mill microphone amplifier assembled around an LF352 opamp. The second part is the 'logic' of the unit — it is found around a 4027 J-K flip-flop. The third section is the speech recording and playback section based on the IC ISD1400. The last part is an AF power amplifier enabling the device to address the culprits, using a convincing volume for the warning message.

The first and fourth parts are not too complex. The only things that are worth mentioning are that P1 is the sensitivity control and P2 is the volume control. Preset P1 regulates the negative feedback on the micro-

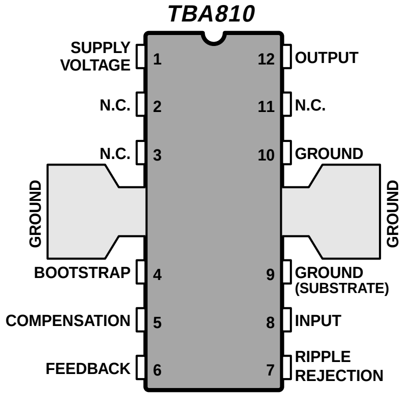
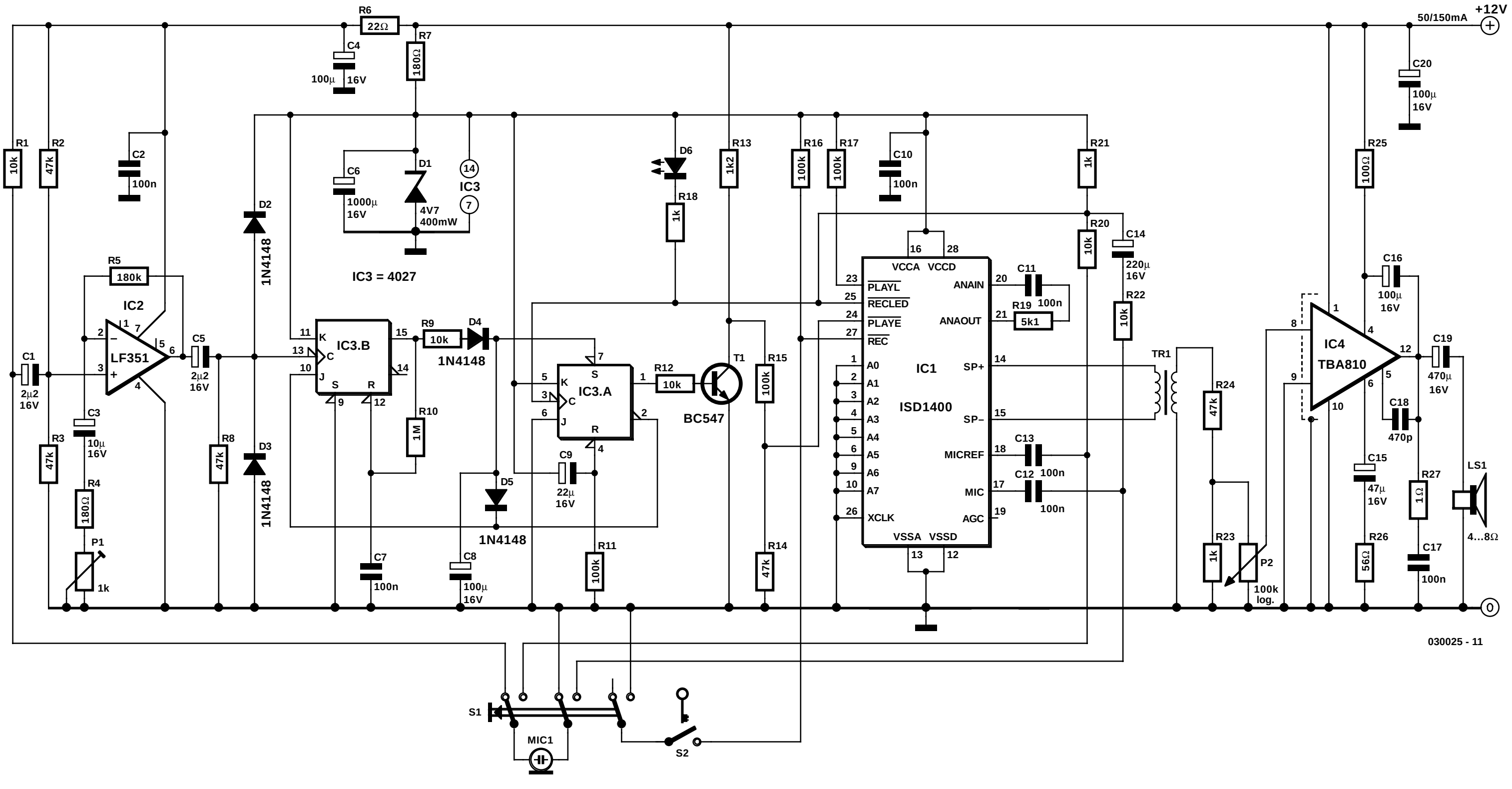


Figure 1. Circuit diagram of the Acoustic Noise Control Device.



phone amplifier and P2 determines the signal level fed to the AF power amplifier input.

The logic used in the circuit is more interesting. After switching on, J-K flip-flop IC3A has its non-inverting output Q at Low. Thus, the J and K inputs of the other flip-flop, IC3B, are held High. The amplified signal from the microphone amplifier, if it has enough level (take into account the sensitivity control), causes IC3B to be clocked. The flip-flop is wired such that it resets itself in a short time (around 0.1 s, determined by R10-C7).

In this way, the microphone signal of any form is 'digitised' into pulses with a duration of 100 ms. At the same time these pulses charge C8 by way of R9. The value of C8 (100 μF) determines the tolerance of the device to sneezing, coughing and so on. When the voltage on C8 is sufficiently high, IC3A toggles, its Q output flipping High and the inverting output, Low. Consequently, C8 is discharged and a Low level is established on the J input of IC3B. This level prevents J-K flip-flop IC3B from producing further pulses regardless of what's going on at its clock input. At the same time T1 starts to conduct, enabling the ISD1400 chip to play back a pre-recorded message. During the playback period the device does not 'hear' itself because IC3B is blocked. When the message is over, the ISD1400 briefly pulls its RECLED output Low, thus resetting the logic part of the circuit to its initial state.

The voice recording/ playback machine

The ISD1400 Chipcorder® is configured according to its standard application circuit gleaned from the product brief posted by Information Storage Devices at
www.winbond-usa.com/products/isd_products/chipcorder/productbriefs/1400_product_brief.pdf
Applying a Low level to its REC input activates recording — playback is triggered by a falling pulse edge at the PLAYE input. During recording the RECLED output goes Low, causing LED1 to come on. At the end of the playback period, RECLED goes Low briefly, which is an indication of the end of the message.

The rest of the circuit is quite simple. Changeover switch S1 enables to use the same electret microphone to be used for recording and monitoring. S2 is a key driven switch preventing the device from recording messages from non-authorized persons (like all too funny students).

The circuit draws about 50 or 150 mA in the standby and activate state respectively. The high value is obviously dependent on the playback volume set on P2.

All components including the 1:1 (600Ω:600 Ω) audio transformer were purchased from Conrad Electronics either separately or as parts of kits. Conrad Electronics' English-language (international) website is at www.int.conradcom.de.

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